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# FOURTH QUARTERLY PROGRESS REPORT

(1 January - 31 March 1974)

## APPLICABILITY OF SKYLAB REMOTE SENSING FOR DETECTION AND MONITORING OF SURFACE MINING ACTIVITIES

SKYLAB EREP INVESTIGATION 9669

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## 1.0 INTRODUCTION

The objective of this investigation is to evaluate EREP imagery as a means of detecting and monitoring strip mines, their environmental effects, and reclamation activities. EREP S-190A and S-190B imagery of a tri-state test area will be analyzed, and some S-192 thermal imagery during a night time pass is desired in hopes of detecting acid waste waters whose temperatures might exceed those of the surrounding environment.

Initially, the investigation will consist of a census of active and inactive strip mines along with estimates of disturbed and reclaimed acreage. Notable damage to the environment will also be included.

The primary test site (816556) extends from latitude 39°00'N to 40°30'N, and longitude 80°00'W to 83°00'W; and encompasses portions of Ohio, West Virginia, and Pennsylvania. The alternate test site (816557) extends from latitude 37°00'N to 39°00'N, and longitude 86°00'W to 89°00'W; and encompasses portions of Indiana, Kentucky, and Illinois.

## 2.0 PROGRESS

### 2.1 SKYLAB 4 OVERPASS AND GROUND TRUTH.

In paragraph 2.4 of the "Third Quarterly Report" dated December 28, 1973 we reported on requesting and justifying thermal infrared imagery data. NASA Houston favored our request and we were given priority for data acquisition on January 24, 1974. A Barnes Precision Radiation Thermometer Model 5 (PRT-5) was borrowed from The Department of Commerce to enable making ground thermal measurements in situ with a Skylab 4 overpass. Major emphasis was to be placed on obtaining ground-truth thermal samples of large plots of reclaimed vegetative canopies, water masses, and barren soil areas. In addition to the PRT-5 we were supplied with contact temperature measuring devices, sample containers for soils and water, photographic cameras, charts, and position locating equipment.

Mr. R. Brooks and Mr. J.D. Pennewell made the trip to West Virginia and contact was made with Mr. James Compton of Grafton Coal Company.

Mr. Compton provided personnel and vehicles for touring active surface mining activities and reclaimed areas of various age brackets. He also made available transportation and crew to aid us for the proposed pre-dawn Skylab overpass. However, a weather frontal system moved in and provided solid cloud cover over the entire area and data acquisition was cancelled.

### 2.2 WEST VIRGINIA AND OHIO VISITATION

As reported in 2.1 Grafton Coal Company provided extensive touring of mining areas. The same is true with

Consolidated Coal Company, Cadiz, Ohio. Mr. Robert Verbosky provided time and transportation to tour the wide spread facilities around Cadiz. It is apparent that large mining companies strive to maximize reclamation of stripped lands and place the upmost importance on public relations and community support. Reclamation has generated improved lands for housing developments, recreation, shopping facilities, and livestock support.

The Coal Research Bureau at West Virginia University was helpful in providing background and current mining activity information and providing contact with Grafton Coal Company.

It was observed that previously stripped areas permitted to naturally reestablish vegetative cover were quite dissimilar to those areas reclaimed quickly after mining. During previous periods of time it was not required to recover with top soil, monitor and/or maintain normal pH, nor cultivate and fertilize. These areas have produced scrub trees and sparse vegetative canopies.

More recently, legislation has required extensive reclamation. These areas are recovered with top soil and produce lush plant covering. Utilization of helicopters for "hydroseeding" quickly establishes plant cover for protection against erosion. It was observed that a few areas in West Virginia and Ohio had to have the land broken up by a disc prior to hydroseeding. Grasses in these areas appeared in rows and provided a strong contrast in texture to the random patterns created without discing.

Within a reclaimed area these could be three distinctive vegetative patterns capable of being detected by remote sensing technology. These are the natural reestablished

cover consisting of scrub growth, the row grasses caused by discing, and the random texture pattern.

## 2.3 RECEIPT OF SKYLAB-3 IMAGERY

Skylab-3 S190A photography was received on January 14, 1974. The 70-mm transparencies consist of:

Mag.	25 frames	017-026
	26	017-026
	27	017-026
	28	017-026
	29	017-026
	30	017-026
Mag.	37 frames	308-313
	38	308-313
	39	308-313
	40	308-313
	41	308-313
	42	308-313
Mag.	43 frames	263-267

Ground track of the SL-3 data frames indicate that several frames were acquired within our primary test site area. Review of the data and 36X enlargements of the 70-mm frames on an Itek Rear Screen Projection Viewer reveal that excessive cloud cover exists on these frames. The 36X magnification indicates that between the approximately 50-60 percent cloud cover and the resulting ground shadows cast by these clouds that meaningful interpretation and analysis cannot be accomplished on this data.

## 3.0 PROBLEMS

### 3.1. SKYLAB DATA RECEIPT AND CONTRACT EXTENSION

This office has not received the ground track and data coverage of SL-4. Preliminary information via

telephone conversations with NASA Houston indicate that photographic coverage of our primary test site area is probably not useful for our analysis. This data is anticipated to be received shortly. However, it is becoming increasingly apparent that SL-2, SL-3, and SL-4 imagery data acquired within our primary test site area is not adequate for meaningful analysis. Therefore, we anticipate being forced to choose our secondary area site for data analysis and application to surface mining activities. Before this can be accomplished we do need receipt of SL-4 ground track and photographic coverage publications. Selection of another primary test site will necessitate additional effort and a time extension.

#### 4.0 PLANS

##### 4.1 CHANGE OF PRIMARY TEST SITE

After receipt of SL-4 publications of ground track and photographic coverage, efforts will be expended in selection of another primary test site from our secondary area. The SL-4 coverage will be plotted on our charts with SL-2 and SL-3 coverage. The area selected will reflect repetitive coverage from SL-2, 3, and 4.